Discussion on "Issues Related to the Modeling of Multipacting for Spoke Resonators" by Frank Krawczyk

The first discussion elaborated on a simulation result that Krawczyk presented for the ANL β=0.4 spoke resonator. The original measurement for the Q vs. E showed a drop in Q around 4 MV/m. This coincides with a predicted multipacting level from the MULTP code. It was remarked that the fact that the Q-drop was removed at LANL by BCP and HPR could also mean that the drop was due to field emission. Shepard added that sometimes the signature of events does not clearly distinguish between multipacting and field emission.

Shepard then listed his general experience with drift space and spoke structures. All these structures show multipacting at very low field levels. He believes that this is 2-point multipacting across the acceleration gaps. This activity can be removed by processing. The processing time varied from fractions of an hour to many hours. A conditioned, cold structure maintained this conditioning. This type of multipacting is not an issue in these structures. Also commissioning on a beam line can handle the requirement of this type of processing, as has been demonstrated for ATLAS. Delayen added that this confirms their experience that commissioning requires one person for one day per structure.

Facco added that they could demonstrate that multipacting in their quarterwave structures happened at a different location than the gaps. They localized it half-way between the gap and the shorting plate. They found the location by disrupting multipacting trajectories by an external small magnet they moved along the outside of the cavity until the multipacting stopped. Facco further provided information about their processing. They do their processing at room temperature. The conditioning seemed to be maintained. The advantage of room temperature processing is the reduced consumption of liquid helium and the additional outgassing of the RF-surfaces during the conditioning.

Shepard continued the listing of his experience by naming high level multipacting barriers (starting at 3 - 5 MV/m) as the real concern in these structures. Not all structures do exhibit this behavior, but when it appears it is much more troublesome. Processing these levels is much harder, as at these levels thermal instabilities at the impact site might be triggered.

He is interested in working with LANL on taking a closer look at the 4 MV/m behavior of the ANL β=0.4 spoke resonator by simulations and measurements. He proposed to do "2nd sound" diagnostics to identify multipacting and compare the results with the simulations to benchmark the codes.

Krawczyk re-emphasized that there is potential, but no clear evidence of multipacting at 4 MV/m for the tested ANL structure. He thinks this event might be a good candidate to study and benchmark simulations.

Next the difference in processing between the ANL and LANL spoke resonators tested at LANL was discussed. The geometric difference is that the LANL cavity (with a long processing time) had flat surfaces in the gaps, while the ANL cavities (with a short processing times) did not have these flat

surfaces. Shepard added that flat surfaces and large areas of cylindrical symmetry seem to be always worse. Still there are not sufficient data to confirm the relationship between the processing time and geometric features.
Kelly reported that during the tests of the ANL spoke resonators soft high level barrier appeared that were simply processed within a short time. The 4 MV/m barrier presented in the presentation might have been one of them. Krawczyk admitted that he does not know enough about the MULTP code to know if the simulation results include any qualification about the severity of a barrier.